Polycyclic aromatic hydrocarbons (PAHs) in fish and invertebrates

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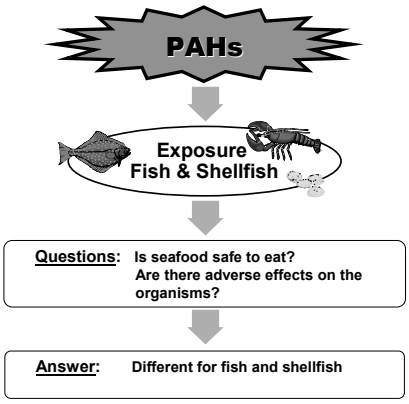
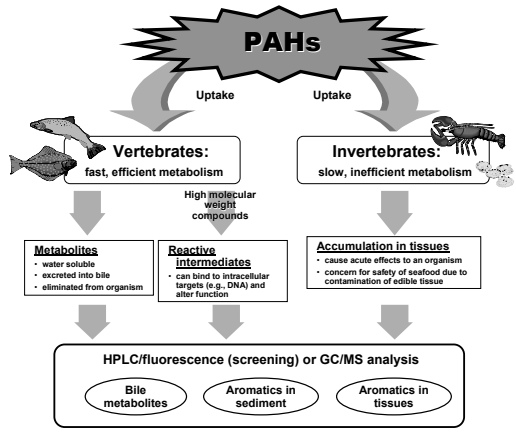
Polycyclic aromatic hydrocarbons (PAHs)

- Petrogenic (LMW) and pyrogenic (HMW) sources
- Natural sources (seeps, fires)
- Anthropogenic sources (spills, internal combustion engines, coal burning, wood preservatives)





Responding to PAH contamination

Questions that need to be answered:

- Chemical composition of the source
- Fate and toxicity of the source
- Resources at risk
- Type of investigation to be conducted
- Sampling design
- Analytical approaches

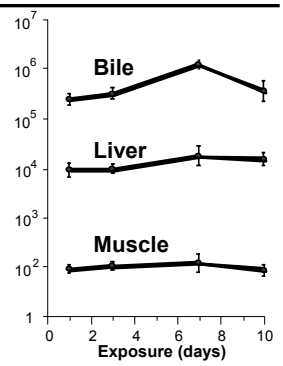
Tiered approach: Screening -vs- Detailed analyses

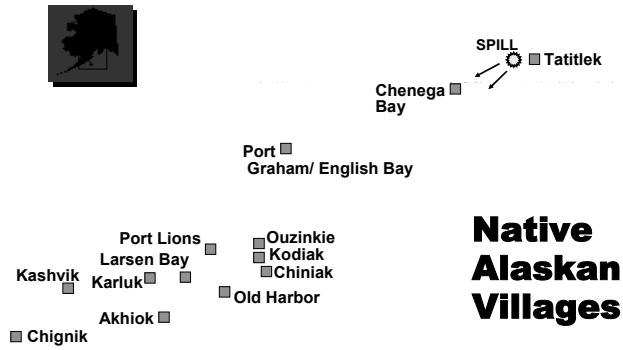
- Screening methods are rapid and cost-effective
- Screening methods provide a semi-quantitative estimate of contamination in samples
- Screening allows priority selection of a subset of samples for detailed analysis (e.g., GC/MS)
- Detailed analyses provide confirmation of screening results
- Detailed analyses provide quantitative information about individual contaminants

Screening Methods: Analyzing AC metabolites in bile

Laboratory exposure of fish to contaminated sediments demonstrated that:

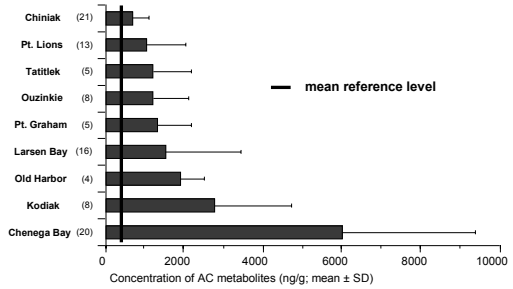
- ACs readily taken up
- ACs extensively metabolized
- Metabolites concentrated in bile for elimination
- Marked differences in tissue concentrations





Native Alaskan Villages

Concentrations of AC metabolites in pink salmon bile following the *Exxon Valdez* oil spill



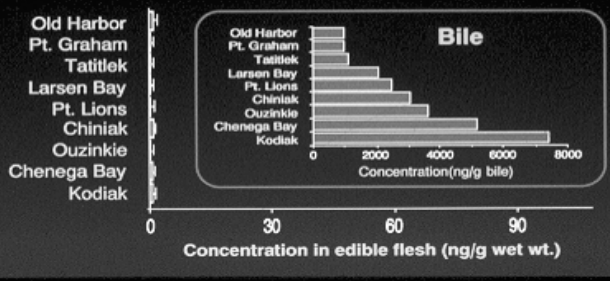
Total PAHs measured in fish muscle and invertebrates after EVOS 1990

Yakutat (reference site)	Total PAHs (ng/g, ww)
Coho salmon muscle (n = 6)	3.0
Mussels (n = 6)	3.0 ± 2.0
Butter clams (n = 9)	1.0 ± 1.0
Littleneck clams (n = 6)	0.8 ± 0.3

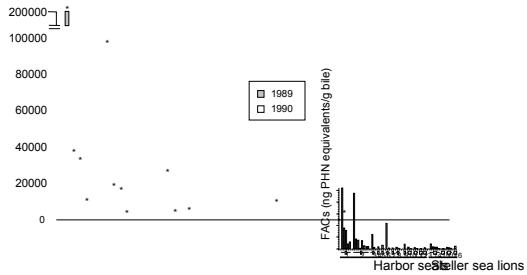
Chenega Bay (oiled site)	Total PAHs (ng/g, ww)
Pink salmon muscle (n = 3)	0.8
Mussels (n = 8)	640 ± 620
Butter clams (n = 9)	330 ± 340
Littleneck clams (n = 16)	120 ± 44

Tatitlek	**Smoked salmon**	**23,000 ng/g wet wt.**
Old Harbor	**Smoked salmon**	**7,900 ng/g wet wt.**

Aromatic contaminants in bottomfish
(halibut, cod, Irish lord, rockfish, and yellowfin sole)



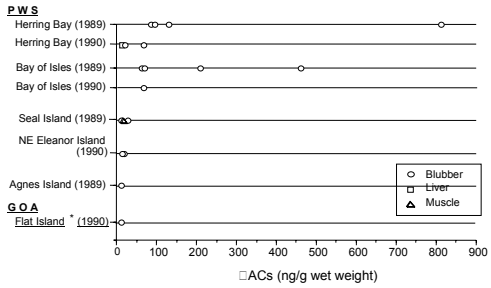
Bile PAHs in Marine Mammals



Sites 1-8 and 14 are located in Prince William Sound and remaining sites in Gulf of Alaska

* Indicates a marine mammal that was visibly oiled

PAHs in Marine Mammals



* Marine mammal from Gulf of Alaska, all others from Prince William Sound

PAHs and Seafood

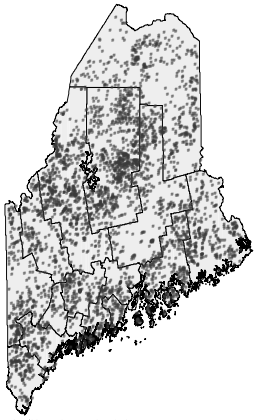
- **PAHs are toxic compounds, derived from a variety of sources, including oil spills and combustion of petroleum.**
- **Fish and invertebrates, when exposed to PAHs, readily assimilate them into their bodies.**
- **Fish efficiently metabolize PAHs, and excrete them from their bodies. It is very rare to detect significant amounts of PAHs in the tissues of fish.**
- **Invertebrates, however, are much less efficient metabolizers of PAHs, and PAHs are commonly found in these species in PAH-contaminated areas.**
- **While PAHs do not accumulate in fish, they have a number of adverse effects on the fish themselves.**

Current/Upcoming Issues with PAHs

- **PAH input into the environment is increasing in many areas**
- **Seafood Safety Standpoint:**
  - **fish (not a concern)**
  - **invertebrates (concern)**
- **Biological Effects Standpoint:**
  - **fish and invertebrates (concern)**
  - **Need to monitor the adverse effects (reproductive, sensory, physiological)**

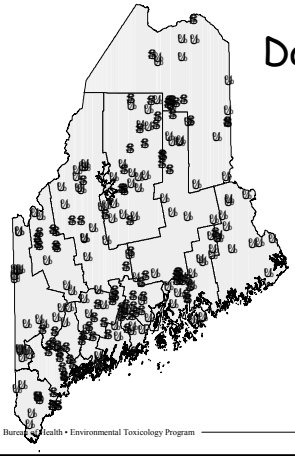
Setting Statewide Advisories based on upper percentile lake averages

Eric Frohmberg
Environmental Toxicology Program
Maine Bureau of Health



Problem

- 3000+ Lakes and Ponds in Maine.
- Need to make inferences based on data
- Use a mean concentration an upper percentile lake average estimate?



Data Sources

- REMAP – 1993 EPA Study
- 120 Random Lakes
- SWAT – 1994 to current – added 80 lakes
- $50,000 per year to support Hg Advisory

Implications in Choice of Statistic

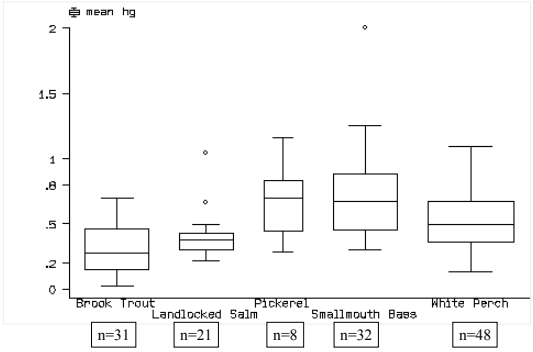
Mean Lake Concentrations

- **Average Population Weighted Exposure**
- **Assumes Random Fishing**

Upper Estimate of Lake Concentration

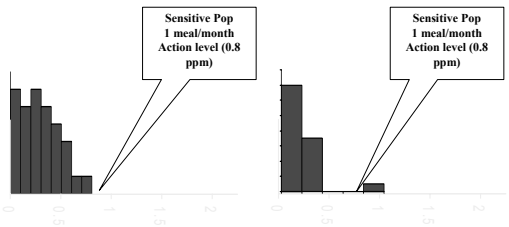
- **Reflects uncertainty**
- **Matches hypothesized exposure patterns**

Variation of Lake Average Hg by Species



Sample size represents number of lakes

% of Lakes above Action Level



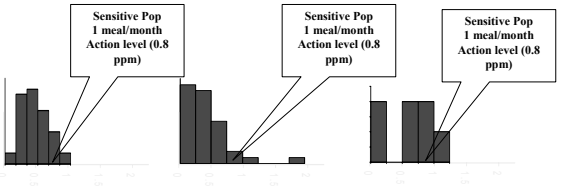
Tissue Conc. ppm

Tissue Conc. ppm

Brook Trout
(n=31 lakes)

Landlocked Salmon
(n=21 lakes)

% of Lakes above Action Level

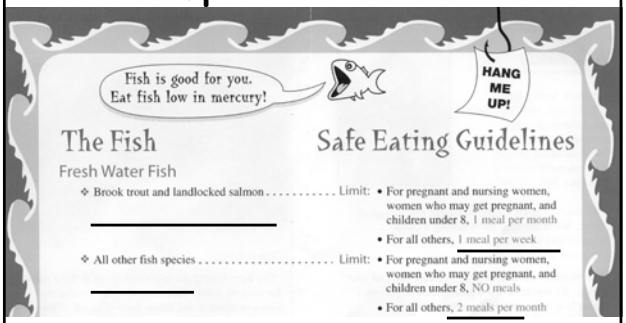


Tissue Conc. ppm | Tissue Conc. ppm | Tissue Conc. ppm

White Perch (n=47 lakes) | Smallmouth Bass (n=32 lakes) | Chain Pickerel (n=7 lakes)

Impact on Advice

Impact on Advice



Implications

Positive

- Reflects what we think we know about exposure
- Reflects uncertainty
- Provides incentive for testing

Negative

- Over protective for the vast majority of lakes

Use of Maine's Statewide Advisory in a Tribal Setting

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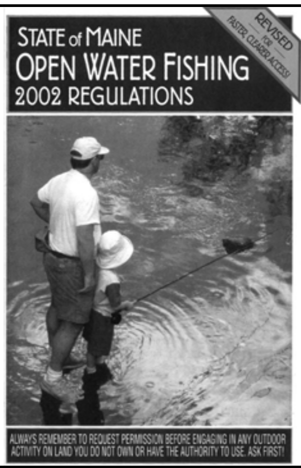
Environmental Chemist
Aroostook Band of Micmacs Environmental Laboratory
E-mail: speterson@micmachealth.org

The Aroostook Band of Micmacs



The State of Maine Bureau of Health Fish Consumption Advisory

As taken from the 2002 Maine Department of Inland Fisheries and Wildlife Regulations

WARNING ABOUT EATING FRESHWATER FISH

Warning: Mercury in Maine freshwater fish may harm the babies of pregnant and nursing mothers, and young children.

SAFE EATING GUIDELINES

- **Pregnant and nursing women, women who may get pregnant, and children under age 8** SHOULD NOT EAT any freshwater fish from Maine's inland waters. Except, for brook trout and landlocked salmon, 1 meal per month is safe.
- **All other adults and children older than 8** CAN EAT 2 freshwater fish meals per month. For brook trout and landlocked salmon, the limit is 1 meal per week.

For more details, including warnings on striped bass, bluefish and lobster tomalley call toll-free 866-292-3474 or visit our web site at http://www.state.me.us/dhs/etp/

It's hard to believe that fish that looks, smells, and tastes fine may not be safe to eat. But the truth is that fish in Maine lakes, ponds, and rivers have mercury in them. Other states have this problem too. Mercury in the air settles into the waters. It then builds up in fish. For this reason, older fish have higher levels of mercury than younger fish. Fish (like pickerel and bass) that eat other fish have the highest mercury levels.

Small amounts of mercury can harm a brain starting to form or grow. That is why unborn and nursing babies, and young children are most at risk. Too much mercury can affect behavior and learning. Mercury can harm older children and adults, but it takes larger amounts. It may cause numbness in hands and feet or changes in vision. The Safe Eating Guidelines identify limits to protect everyone.

Warning: Some Maine waters are polluted, requiring additional limits to eating fish.

Fish caught in some Maine waters have high levels of PCBs, Dioxins or DDT in them. These chemicals can cause cancer and other health effects. The Bureau of Health recommends additional fish consumption limits on the waters listed below. Remember to check the mercury guidelines. If the water you are fishing is listed below, check the mercury guideline above and follow the most limiting guidelines.

SAFE EATING GUIDELINES

Androscoggin River Gilead to Merrymeeting Bay:	6–12 fish meals a year.
Dennys River Meddybemps Lake to Dead Stream:	1–2 fish meals a month.
Green Pond, Chapman Pit, & Greenlaw Brook (Limestone):	**Do not eat any fish from these waters.**
Little Madawaska River & tributaries (Madawaska Dam to Grimes Mill Road):	**Do not eat any fish from these waters.**
Kennebec River Augusta to the Chops:	**Do not eat any fish from these waters.**
Shawmut Dam in Fairfield to Augusta:	5 trout meals a year, 1–2 bass meals a month.
Madison to Fairfield:	1–2 fish meals a month.
Meduxnekeag River	2 fish meals amonth.
North Branch Presque Isle River	2 fish meals a month.
Penobscot River below Lincoln:	1–2 fish meals a month.
Prestile Stream:	1 fish meal a month.
Red Brook in Scarborough	6 fish meals a year.
Salmon Falls River below Berwick:	6–12 fish meals a year.
Sebasticook River (East Branch, West Branch & Main Stem) (Corinna/Hartland to Winslow):	2 fish meals a month.

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FISH CONSUMPTION ADVISORY

The Maine Department of Human Services, Bureau of Public Health has issued a health advisory for two saltwater species: striped bass and bluefish. Due to the presence of PCBs and Mercury, consumption of striped bass and bluefish should be limited as follows:

Public Health Advisory:
Warning: Chemicals in some Maine saltwater fish may harm people who eat them. Women who are or may become pregnant and children should carefully follow the Safe Eating Guidelines. The Maine Department of Human Services, Bureau of Public Health has issued a health advisory for several saltwater species for 2001. It's hard to believe that fish that look, smell, and taste fine may not be safe to eat. But the truth is that some saltwater fish have mercury, PCBs and Dioxins in them. All these chemicals settle into the ocean from the air. PCBs and Dioxins also flow into the ocean through our rivers. These chemicals then build up in fish. Small amounts of mercury can damage a brain starting to form or grow. That's why babies in the womb, nursing babies, and young children are at most risk. Mercury can also harm older children and adults, but it takes larger amounts. PCBs and Dioxins can cause cancer and other health problems if too much build up in your body. Due to the possible presence of these chemicals, the Maine Department of Human Services, Bureau of Public Health asks that all consumers of the following saltwater species adhere to the following safe eating guidelines.

SAFE EATING GUIDELINES

- **Striped Bass and Bluefish:** Eat no more than 2 meals per month.
- **Shark, Swordfish, King Mackerel, and Tilefish:** Pregnant and nursing women, women who may get pregnant and children under 8 years of age are advised to not eat any swordfish or shark. All other individuals should eat no more than 2 meals per month.
- **All other ocean fish and shellfish, including canned fish and shellfish:** Pregnant and nursing women, women who may get pregnant and children under 8 years of age should eat no more than 2 meals per week.

Anyone wanting further information concerning fish consumption advisories should contact the Bureau of Public Health directly at (866)-292-3474 or at (207) 287-6455.

CONTACT MARINE PATROL AT THE FOLLOWING NUMBERS

Division I (Kittery-Thomaston), Bureau of Marine Patrol,
Post Office Box 8, McKown Point, West Boothbay Harbor, ME 04575; (207) 633-9595

Division II (Thomaston-Calais), Bureau of Marine Patrol,
RFD #2, c/o Lamoine State Park, Ellsworth, ME 04605; (207) 667-3373

For emergencies, 24 hours per day, Marine Patrol Officers are available through the Maine State Police at:

1-800-452-4664, Augusta Barracks
1-800-228-0857, Gray Barracks
1-800-432-7381, Orono Barracks
1-800-432-7303 (Washington County Regional Communications)

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↑ *outside*

Keeping Our Traditions and Our Families Alive

Is The Fish I'm Feeding My Family Safe?

Fishing is a tradition many Native Americans still preserve and practice. Fish are an important part of a healthy diet. They are a lean, low-calorie source of protein. To our ancestors, fishing was necessary to feed their families. However, today's lakes, rivers, and oceans contain chemicals that could pose health risks if these fish are eaten in large amounts. It's hard to believe fish that looks, smells, and tastes fine may not be safe to eat. Keep your family and traditions alive by following the *Safe Eating Guidelines* and these three easy steps.

Step #1
Call Your Local or State Environmental Health Departments.
Your favorite fishing hole may have high levels of chemical pollutants. Contact your local or state environmental health departments to see if any health advisories are posted in areas you fish. (see back panel for contact information)

Step #2
Select Certain Kinds and Sizes of Fish for Eating.
If you eat game fish, such as lake trout, salmon, and bass, eat smaller, younger fish. They are less likely to contain harmful levels of pollutants than larger, older fish. Eat top feeders, such as perch, brook trout and smelt, instead of bottom feeders like catfish and carp. They feed on insects and are less likely to contain high levels of harmful chemicals.

Step #3.
Clean and Cook your Fish Properly.
It is a good idea to remove the skin, fat, and internal organs as soon as possible. Follow proper food handling and storage techniques to prevent the growth of bacteria and viruses. The way you cook fish can make a difference in the kinds and amounts of chemical pollutants remaining in the fish. Grill, bake, or broil your fish so fat possibly containing pollutants can drain away. Eat less deep-fried fish because frying seals in any chemicals that may be present in that fish. Lastly, if you like smoked fish, remember to fillet the fish and remove the skin before smoking.

inside →

Safe Eating Guidelines

Freshwater Fish

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- All other adults and children older than age 8 CAN EAT 2 fish meals per month. For brook trout and landlocked salmon, the limit is 1 meal per week.

Saltwater Fish and Lobster

- Striped Bass and Bluefish: Eat no more than 2 meals per month.
- Shark, Swordfish, Mackerel, and Tilefish: Pregnant and nursing women, women who may get pregnant and children under age 8 are advised to NOT EAT any of these fish. All other individuals should eat no more than 2 meals per month.
- Canned Tuna: Pregnant and nursing women, women who may get pregnant and children under age 8 should eat no more than 1 can of 'white' tuna or 2 cans of 'light' tuna per week.
- All other ocean fish and shell fish, including lobster, eat no more than 2 meals per week.
- Lobster Tomalley: NO CONSUMPTION.

State and Local Contacts

For more information or current health advisories, contact the following:

Micmac Environmental Health Dept.
8 Northern Road
Presque Isle, Maine 04769

764-7219 ext.118 or out of area
1-800-750-1972

Maine Bureau of Health, Environmental Toxicology Program

1-866-292-3474 or

www.state.me.us/dhs/etp/fca.htm

U.S. Environmental Protection Agency, Offices of Water

Fish Contamination Program (4305)
401 M Street, SW
Washington, DC 20460 or

www.epa.gov/ost/fishadvice

Keeping Our Traditions and Our Families Alive

For many years our people have fished the waters of Maine. Unfortunately, these waters are being poisoned and precautions should be taken when eating the fish you catch.

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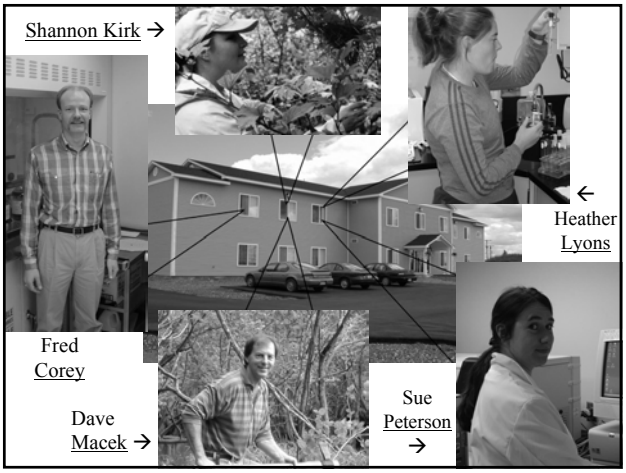
Plans for the Future

- anthropological research combined with elements of a consumption survey
- interviews with Tribal elders
- Tribal based risk assessment



MICMAC HEALTH DEPARTMENT

8 Northern Road
Presque Isle, Maine 04769
Ph: (207) 764 – 7219

E-mail: **fcorey@micmachealth.org** (Environmental Director) - or - **speterson@micmachealth.org** (Environmental Chemist)

North Dakota's Fish Consumption Advisory:

A Statewide Advisory Based on Average Concentration

Presented by
Mike Ell, Environmental Scientist
ND Dept of Health
Bismarck, ND

October 22, 2002

Outline

- History
- Development of Current Statewide Advisory
- Considerations for the Future

History

- First fish collections for mercury analysis in 1991
  - Resulted in limited fish advisory for Devils Lake during the summer of 1991
- First published advisory occurred in March 1992
  - Included ten lakes and reservoirs, including Devils Lake, and two rivers

- Continued sampling with additional lakes and reservoirs added each year
- Peaked in the mid 90's with over 30 lakes and rivers and 20 species of fish listed
- Numbers declined through the late 90's due to limited sampling
  - Focus on Devils Lake and Lake Sakakawea
    - Predominant fisheries in the state
    - Research interest in mercury effects and lake manipulations

Statewide Advisory

- First issued in January 2001
- Rational
  - Mercury occurs in fish in all lakes, reservoirs, rivers, and streams in the state
  - For advise to be useful it shouldn't be complicated
- Based on standard assumptions and existing fish tissue data for all lakes and rivers
- Final advisory reduced to simple consumption advice

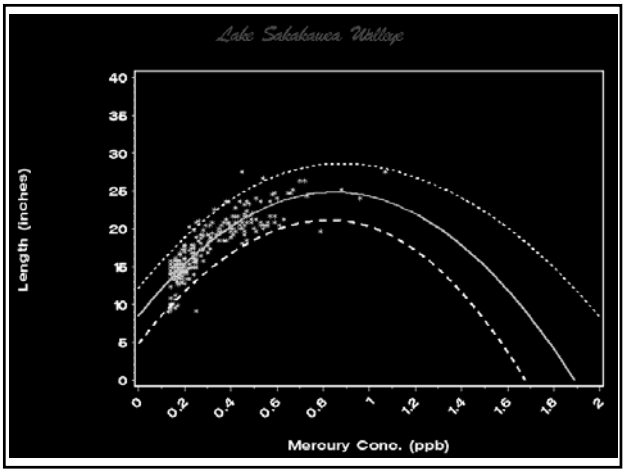
Dose Management for a Generic Statewide Fish Consumption Advisory

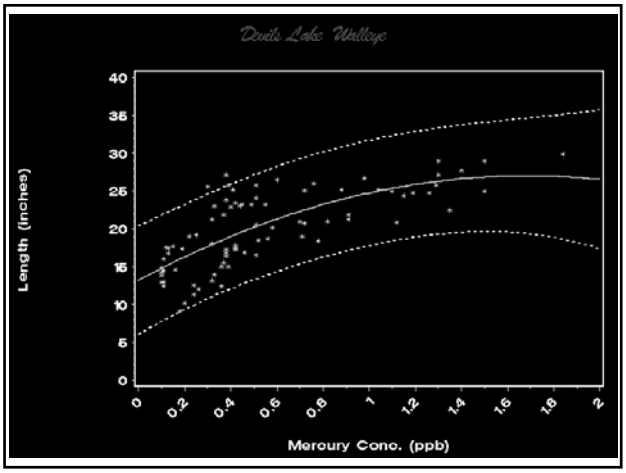
Assumptions

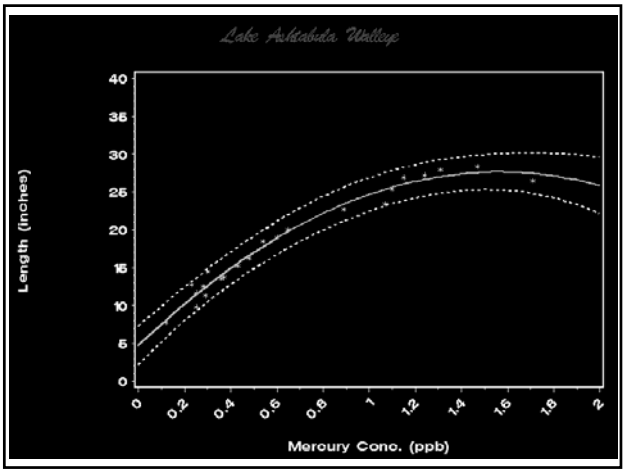
	EPA's RfD mg(MHg)/kg-bw/day	Body Weight kilograms	Average Meal Size ounces	Maximum Average Daily Dose mg(MHg)/day
Children under age 6	0.0001	20	4	0.002
Pregnant and nursing women	0.0001	60	8	0.006
Children between ages 6 and 15	0.0003	40	8	0.012
All other women	0.0003	60	8	0.016
All other men	0.0003	75	10	0.0225

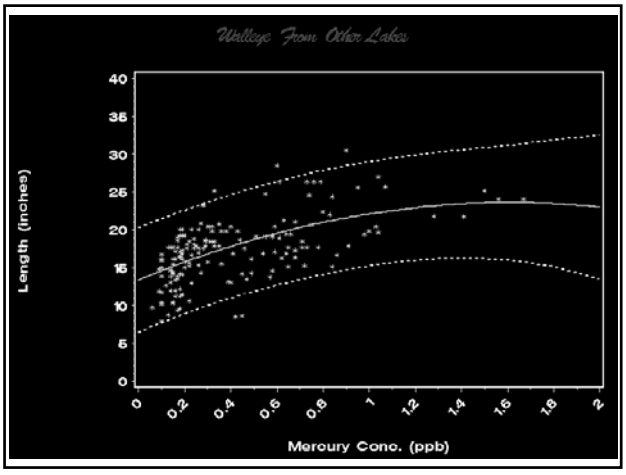
Dose Control

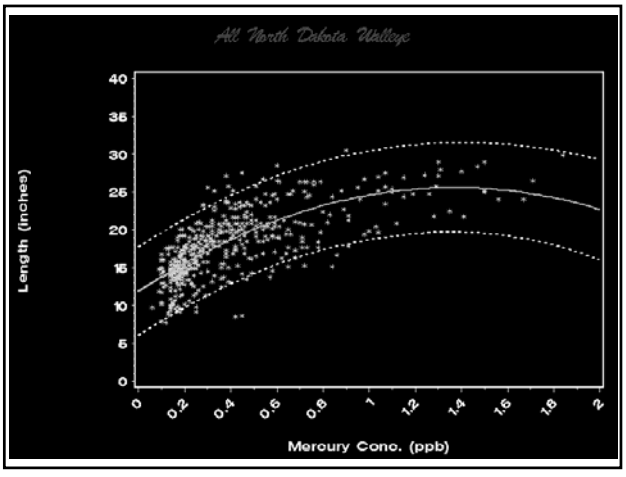
	Maximum Methyl-Mercury Concentration in Fish			
	8 meals/month	4 meals/month	2 meals/month	1 meal/month
Children under age 6	0.067	0.134	0.268	0.536
Pregnant and nursing women	0.101	0.201	0.402	0.804
Children between ages 6 and 15	0.201	0.402	0.804	1.608
All other women	0.302	0.603	1.206	2.413
All other men	0.302	0.603	1.206	2.413











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Children under age 6	0.0001	20	4	0.002
Pregnant and nursing women	0.0001	60	8	0.006
Children between ages 6 and 15	0.0003	40	8	0.012
All other women	0.0003	60	8	0.018
All other men	0.0003	75	10	0.0225

Dose Control

	Maximum Methyl-Mercury Concentration in Fish			
	8 meals/month	4 meals/month	2 meals/month	1 meal/month
Children under age 6	0.067	0.134	0.268	0.536
Pregnant and nursing women	0.101	0.201	0.402	0.804
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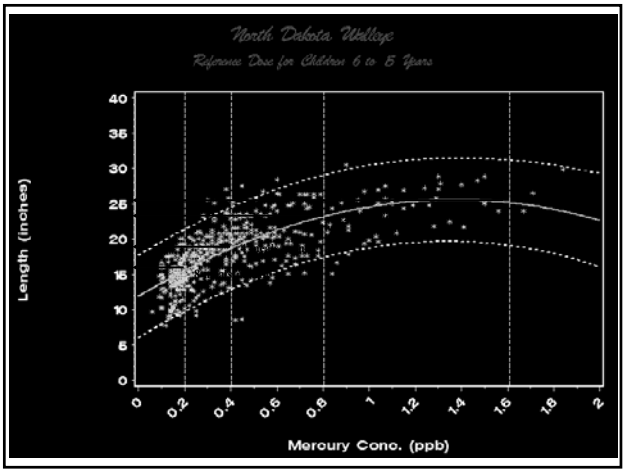


NORTH DAKOTA ADVISORY FOR HUMAN CONSUMPTION OF FISH

The chart applies to fisheries of the state; data for crappie, trout and white sucker are incomplete, and the fish in many lakes, reservoirs and rivers have not been sampled. It does not consider other human exposures of methylmercury (as mercury), such as eating ocean or other inland fish.

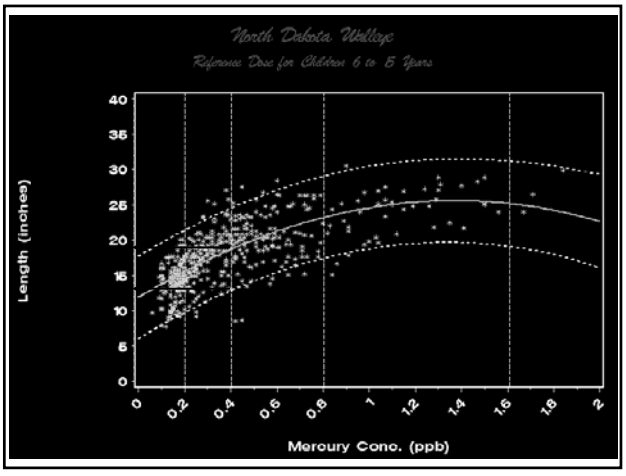
Meal frequencies: none – no consumption advised
occasional – occasional consumption, 1 to 2 meals per month, avoid eating whoppers
moderate – moderate consumption, 2 to 4 meals per month
frequent – frequent consumption, 4 to 8 meals per month

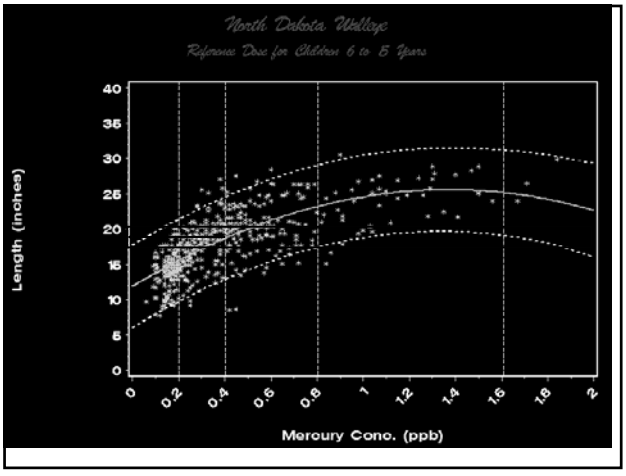
Summary: "children 5 & younger," pregnant women and nursing women can occasionally eat only smaller fish; and children over age 5 and all other adults can frequently eat smaller fish while limiting the meals of medium and larger fish.

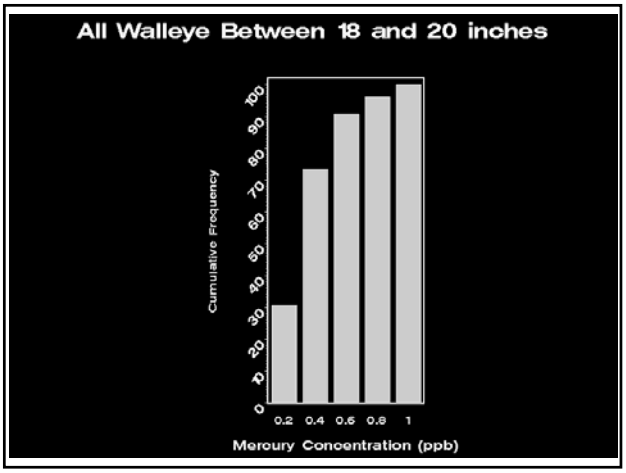
		Fish Size				
Fish Species		Smaller	or	Medium	or	Larger
BASS, largemouth smallmouth	Children 5 & younger	occasional		none		none
	Pregnant &nursing women	occasional		occasional		none
smaller sizes are less than 16 inches	Children over 5 & under 15	moderate		moderate		moderate
	All other people	frequent		moderate		moderate
BASS, white	Children 5 & younger	occasional		none		none
smaller sizes are less than 12 inches	Pregnant & nursing women	moderate		moderate		occasional
	Children over 5 & under 15	frequent		moderate		occasional
	All other people	frequent		moderate		moderate
CHINOOK SALMON	Children 5 & younger	moderate		occasional		occasional
smaller sizes are less than 19 inches	Pregnant & nursing women	moderate		moderate		occasional
	Children over 5 & under 15	frequent		moderate		moderate
	All other people	frequent		frequent		moderate
NORTHERN PIKE	Children 5 & younger	moderate		occasional		occasional
smaller sizes are less than 29 inches	Pregnant & nursing women	moderate		moderate		occasional
	Children over 5 & under 15	frequent		moderate		occasional
	All other people	frequent		moderate		moderate
WALLEYE CHANNEL CATFISH	Children 5 & younger	moderate		occasional		occasional
	Pregnant & nursing women	moderate		moderate		occasional
smaller sizes are less than 22 inches	Children over 5 & under 15	frequent		moderate		moderate
	All other people	frequent		moderate		moderate
YELLOW PERCH	Children 5 & younger	moderate		moderate		occasional
smaller sizes are less than 11 inches	Pregnant & nursing women	moderate		moderate		occasional
	Children over 5 & under 15	frequent		moderate		moderate
	All other people	frequent		frequent		frequent

Why Use The Mean Concentration?

- **Provides more flexibility to the consuming public**
  - **Give the public more opportunity to keep fish and to eat those fish**
- **While providing protection**







Considerations for the Future

- **Sample Design**
  - **Targeted vs Statewide Sampling**
  - **Probablistic Sampling**
- **Public Communication**

Note: The following slides are from the presentation by Bob Frey

MERCURY ADVISORIES – APRIL 11, 2001

- WAITED FOR NAS VALIDATION OF EPA RfD
- BASED ON EPA 1999 FACT SHEET
  EPA-823-F-99-016, SEPTEMBER 1999
- MODIFIED LEVELS SLIGHTLY FOR EASE OF USE
- CROSS-CHECKED WITH PCB ADVICE
- ISSUED NEARLY 80 NEW ADVISORIES

ADVISORY TRIGGERS

CATEGORY	PA	FACT SHEET
UNRESTRICTED	0 - 0.12	>0.08 – 0.12*
1 MEAL/WEEK	0.13 – 0.25	>0.12 – 0.24
2 MEALS/MONTH	0.26 – 0.50	>0.32 – 0.48
1 MEAL/MONTH	0.51 – 1.0	>0.48 – 0.97
6 MEALS/YEAR	1.01 – 1.9	>0.97 – 1.9
DO NOT EAT	> 1.9	> 1.9

* 8 MEALS/MONTH

DATA

551 MERCURY DATA POINTS
10 YEARS OF DATA

ADVICE	NUMBER	% OF SAMPLES
UNRESTRICTED	222	40
1 MEAL/WEEK	169	31
2 MEALS/MONTH	118	21
1 MEAL/MONTH	37	7
6 MEALS/YEAR	5	>1
DO NOT EAT	0	- -

DATA EXAMPLES

SPECIES	# SAMPLES	Hg RANGE mg/kg
WALLEYE	44	0.069 – 1.564
LARGEMOUTH BASS	54	0.078 – 0.99
SMALLMOUTH BASS	97	0.06 – 0.733
BROWN TROUT	75	0.007 – 0.856
CARP	50	0.04 – 0.576
CHANNEL CATFISH	37	0.027 – 0.78

SPECIES COMPARISONS

CATEGORY	WALLEYE	LARGEMOUTH	SMALLMOUTH
UNRESTRICTED	3 (7%)	8 (15%)	17 (18%)
1 MEAL/WEEK	13 (30%)	18 (33%)	33 (34%)
2 MEALS/MONTH	18 (41%)	19 (35%)	39 (40%)
1 MEAL/MONTH	5 (11%)	9 (17%)	8 (8%)
6 MEALS/YEAR	5 (11%)	0	0
DO NOT EAT	0	0	0

SPECIES COMPARISONS II

CATEGORY	WALLEYE	BROWN TROUT	CARP
UNRESTRICTED	3 (7%)	52 (70%)	29 (58%)
1 MEAL/WEEK	13 (30%)	19 (25%)	15 (30%)
2 MEALS/MONTH	18 (41%)	3 (4%)	5 (10%)
1 MEAL/MONTH	5 (11%)	1 (1%)	1 (2%)
6 MEALS/YEAR	5 (11%)	0	0
DO NOT EAT	0	0	0

STATEWIDE ADVISORY – APRIL 11, 2001

- EAT NO MORE THAN 1 MEAL/WEEK OF RECREATIONALLY CAUGHT SPORT FISH
- REASONS:
  - UNTESTED WATERS
  - UNTESTED SPECIES IN WATERS WITH ADVISORIES
  - CURRENTLY UNKNOWN CONTAMINANTS

TMDL IMPLICATIONS

- PA LISTS WATERS WITH ADVISORIES ON 303(d)
- HOW DO YOU HANDLE A STATEWIDE ADVISORY WATERS WITH ACTUAL DATA ARE TO BE LISTED

OPTION 1 – LIST ONLY WATERS WITH 2 MEALS/MONTH OR MORE RESTRICTIVE

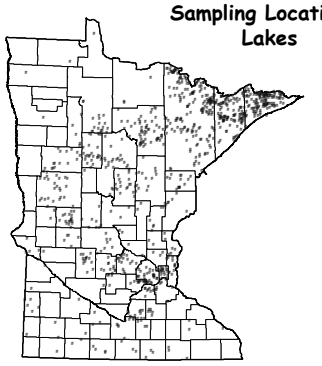
OPTION 2 – ALSO LIST WATERS WHERE ACTUAL DATA SHOW 1 MEAL/WEEK

Minnesota Statewide Fish Consumption Advice

Pat McCann
Minnesota Department of Health
October 22, 2002

Why have a Statewide Advisory?

- Can't test every water and every species
- Some level of Hg is in every fish we test
- Every water should some advice – particularly for the sensitive population
- Myth - the waters listed in the fish advisory are bad, others good
- Simplify the communication

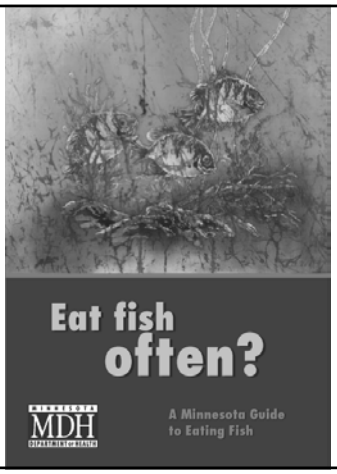


Can existing data be used to predict untested waters advice?

- Yes and No – not with statistical rigor, but yes in a general sense
- High variability in meHg production
  - Predictors not completely understood or measured
- Sampling not designed for predictive purposes (selection bias and sample type consistency problems)

A "Weight of Evidence" Approach

- Data Analysis
  - Means and regression analysis
    - By species and geographic location
- Harvest rates
- Input from other state agencies
- Consistency with neighboring states
- Consistency with site-specific advice format



Safe Eating Guidelines: *General Population*

For adults who eat fish all year long*

Kind of fish	How often can you eat it?
Fish caught in Minnesota:	
Sunfish, crappie, yellow perch, bullheads	→ unlimited amount
Walleyes, northern pike, smallmouth bass, largemouth bass, channel catfish, flathead catfish white sucker, drum, burbot, sauger, carp, white bass, rock bass, other species	→ 1 meal a week
Commercial fish:	
Limit the following species: shark, swordfish, tile fish, king mackerel	→ 1 meal a month

* In general, adults who eat fish just during vacation or one season can eat fish twice as often as recommended in these guidelines.

Safe Eating Guidelines: *Special Populations*

For pregnant women, women who may become pregnant and children under age 15*

Kind of fish	How often can you eat it?
Fish caught in Minnesota:	
Sunfish, crappie, yellow perch, bullheads	→ 1 meal a week
Walleyes shorter than 20 inches, northern pike shorter than 30 inches, smallmouth bass, largemouth bass, channel catfish, flathead catfish white sucker, drum, burbot, sauger, carp, white bass, rock bass, other species	→ 1 meal a month
Walleyes longer than 20 inches, northern pike longer than 30 inches, muskellunge	→ **Do not eat.**
Commercial fish:	
• Shark, swordfish, tile fish, king mackerel	→ **Do not eat.**
• Other commercial species, including canned tuna	→ See MDH's brochure, *"An Expectant Mother's Guide to Eating Minnesota Fish,"* for guidelines.

Special Note: Please see the two tables on page 6 for exceptions to these guidelines. These exceptions are for eating fish from certain Minnesota waters known to have higher levels of contaminants. →

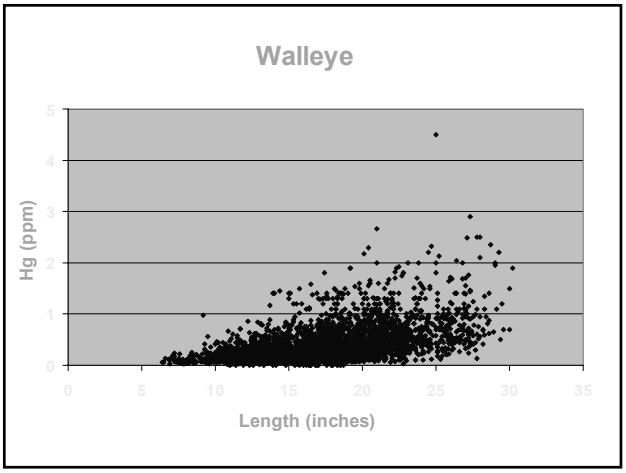
* There is no change in these guidelines for eating fish just during vacation or one season.

Input from other Agencies

- Department of Natural Resources
  - Continue to provide site-specific advice
  - Concern about list of "bad" waters
  - Concern about future funding for monitoring
- Pollution Control Agency
  - In line with their trend and mechanistic work
  - TMDL list
  - Concern about future funding for monitoring
- Tourism
  - Concern about list of "bad" waters and impact on northern MN

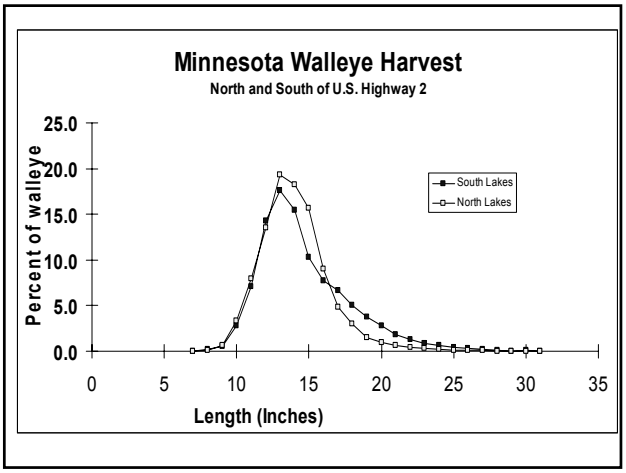
Meal Advice Categories – Mercury Women and Children

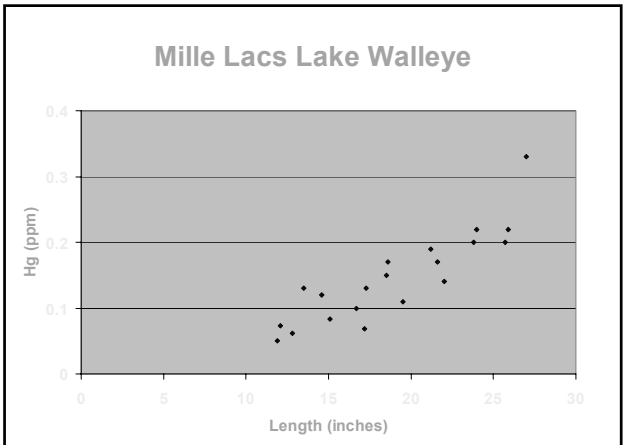
Unlimited consumption	< 0.05 ppm
1 meal / week	0.06 - 0.2 ppm
1 meal / month	0.21 - 1.0 ppm
Do not eat	> 1.0 ppm



Means Analysis

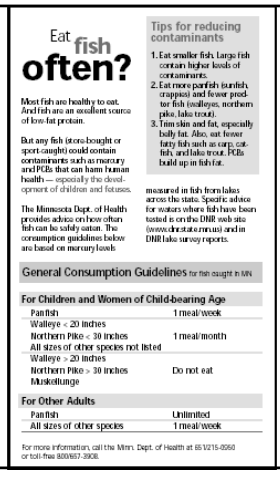
	N	Mean (µg/g)	Upper 95%CI on mean
All Walleye	3761	0.39	0.41
NE Walleye	2268	0.45	0.47
Not NE Walleye	1493	0.31	0.32





Communication

- General Statewide Advice
  - "Eat fish often?" and Mom's Guide brochures
  - MDH web site
  - DNR Fishing Regulations
- Site Specific Advice
  - MDH web site
  - DNR Lake Reports - web and hard copy



Eat fish often?

Most fish are healthy to eat. And fish are an excellent source of low-fat protein.

But any fish (store-bought or sport-caught) could contain contaminants such as mercury and PCBs that can harm human health — especially the development of children and fetuses.

The Minnesota Dept. of Health provides advice on how often fish can be safely eaten. The consumption guidelines below are based on mercury levels measured in fish from lakes across the state. Specific advice for waters where fish have been tested is on the DNR web site (www.dnr.state.mn.us) and in DNR lake survey reports.

Tips for reducing contaminants

1. Eat smaller fish. Large fish contain higher levels of contaminants.
2. Eat more panfish (sunfish, crappies) and fewer predator fish (walleyes, northern pike, lake trout).
3. Trim skin and fat, especially belly fat. Also, eat fewer fatty fish such as carp, catfish, and lake trout. PCBs build up in fish fat.

General Consumption Guidelines for fish caught in MN

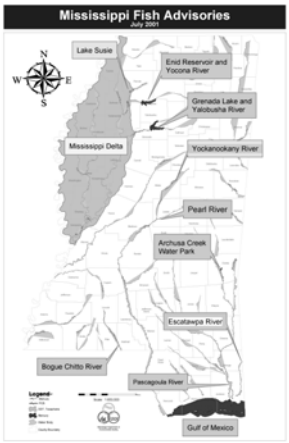
For Children and Women of Child-bearing Age	
Panfish	1 meal/week
Walleye < 20 inches	
Northern Pike < 30 inches	1 meal/month
All sizes of other species not listed	
Walleye > 20 inches	
Northern Pike > 30 inches	Do not eat
Muskellunge	
For Other Adults	
Panfish	Unlimited
All sizes of other species	1 meal/week

For more information, call the Minn. Dept. of Health at 651/215-0950 or toll-free 800/657-3908.

Regional Fish Advisory for the Mississippi Delta

MISSISSIPPI DEPARTMENT OF ENVIRONMENTAL QUALITY

Henry Folmar
October 21, 2002



Fishing is an important part of the culture in the Delta.

Most Delta fisherman eat what they catch.

DDT in the Delta is not a new problem.

- **DDT was heavily used as a cotton insecticide beginning shortly after WWII.**
- **Decline in fish eating species like the Bald Eagle and Brown Pelican.**
- **Fish Advisories for Wolf, Mossy and Washington Lakes in 1970's.**
- **DDT was banned in 1972 and toxaphene in 1982.**

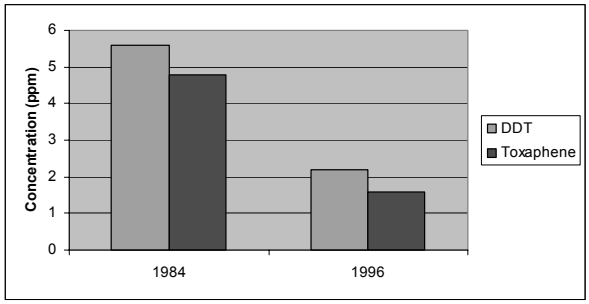
Recent studies show DDT and toxaphene levels in the Delta are among the highest in the country:

- **USFWS - Yazoo R. @ Redwood - whole carp had highest DDT levels of 112 sites across the country.**
- **USFWS - Monitored pesticides in fish and wildlife on refuges around the country. Led to closure of Yazoo Refuge to Fishing.**
- **USGS - NAWQA Study - MS portion of Delta had highest levels of DDT and toxaphene in fish of any of their 230 sites nationwide.**

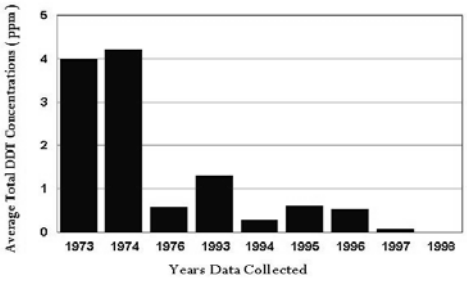
DDT and toxaphene levels in fish in the Delta are declining.

- **Data from USFWS and MDEQ and other agencies show conditions are improving.**

Concentrations of DDT and toxaphene in whole carp from the Yazoo River at Redwood, MS (USFWS).



Average DDT concentrations in largemouth bass in the Delta 1973-1998 (MDWFP, MDEQ)



So if things are getting better, why all the fuss?

- The level considered to be safe has changed.
- FDA rescinded their action level for DDT in 1993.
- States were encouraged to begin using EPA guidance that was more protective.
- The Mississippi Fish Advisory Task Force led an effort to develop new criteria following the EPA guidance

Criteria Setting Process

- MS Fish Advisory Task Force (DEQ, DH, DWFP, DAC, and DMR)
- Followed EPA Guidance
- Technical Review Committee (UMC, MSU, USGS, USDA, USFWS, EPA, COE)

Mississippi Fish Advisory Criteria for DDT and Toxaphene

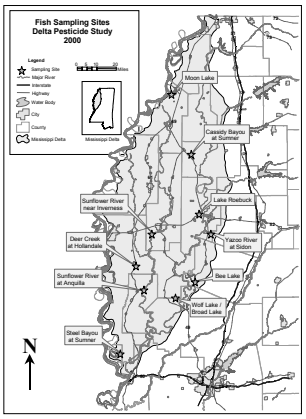
Fish Tissue Concentration (mg/kg)		
Consumption	DDT	Toxaphene
No limit	<1.0	<0.4
2 meals/month	1.0 - 5.9	0.4 - 1.9
No Consumption	≥6.0	≥2.0

The objectives of the Mississippi Delta Fish Tissue Study were to:

- Evaluate the concentration of DDT and toxaphene in edible tissue from 10 selected sites.
- Use these data to evaluate human health risks associated with eating fish.
- Develop a species concentration gradient for DDT and toxaphene that will help focus future monitoring efforts.

Sampling Sites

Mississippi Delta Fish Tissue Study 2000

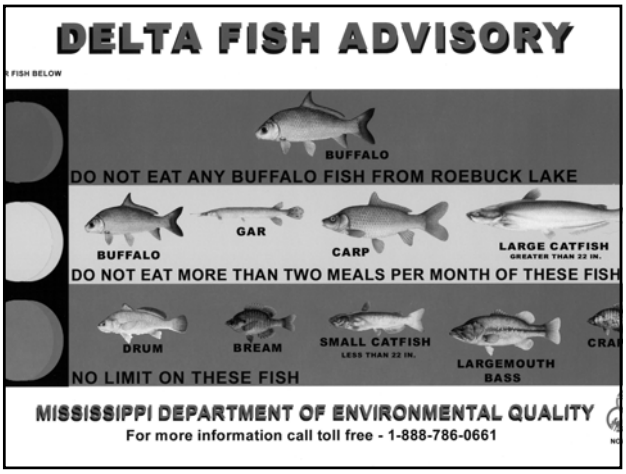


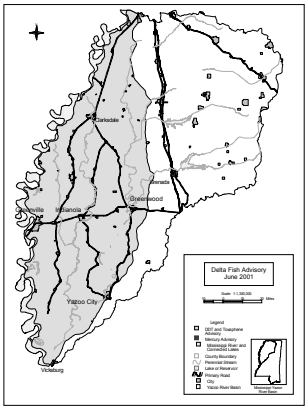
Good News:

- **All largemouth bass, bream, crappie, freshwater drum and all catfish less than 3lbs were below the criteria at all sites.**
- **66% of all samples were below the criteria for DDT.**
- **73 % of all samples were below the criteria for toxaphene.**
- **Farm raised catfish samples were below the criteria for both DDT and toxaphene.**

Bad News:

- **All ten sites had at least two samples that exceeded Mississippi's limit consumption criteria for DDT or toxaphene.**
- **7 of 9 Cassidy Bayou samples exceeded the criteria.**
- **7 of 13 Roebuck Lake samples exceeded the criteria, including 3 samples that were above the no consumption criteria.**
- **Some form of advisory was warranted at each site sampled**





Delta Fish Tissue Advisory Area

- Includes Mississippi Portion of Delta from Memphis to Vicksburg from MS River Levee to the bluff hills.
- Does not include MS River or connected oxbow lakes.

Outreach/Public Information

- News Conference in Jackson/Stoneville
- News Release
- Sampling Demo for TV and Print Media
- Radio and TV spots on Delta Area Morning Shows
- Call in shows on gospel and blues radio stations in and around the Delta
- Sent letters and posters to Delta Area Fish Markets and Grocery Stores

Outreach Efforts Cont'd

- Went door to door in some communities explaining advisories and answering questions.
- Participated in two Delta area Health Fairs (Greenville and Clarksdale).
- Participated in three Wildlife Expos in Greenville and Jackson
- Appeared on Mississippi Outdoors TV Show.
- Appeared on Listen to the Eagle, a statewide radio call in show.

Outreach Efforts Cont'd

- Sent letters, maps and brochures to all commercial fishermen in the state.
- Printed Advisories in MDWFP Outdoor Digest.
- Printed Signs for Roebuck Lake and rest of Delta.
- MDWFP and MDEQ put up signs at boat ramps and public fishing areas.
- Placed Maps, Brochures, Posters, and Advisory Table on MDEQ WebSite.
- Mailed letters, maps and brochures to 1400

Outreach Efforts (Cont'd)

- 16,000 Coloring books for distribution in schools, head start programs and other children's groups.
- Distribution of posters and brochures through WIC offices and county Health Departments in the Delta.
- Fish Advisory Brochure and Poster in Spanish.

Next Steps

- Continue monitoring looking for hot spots and clean areas that can be removed from advisory.
- Continue Outreach Efforts.
- TMDL's by June 2003.

Questions?

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1542 Old Whitfield Road
Pearl, MS 39208

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Henry_Folmar@deq.state.ms.us